

CVO-400
PRJ-1.10

Mr. Edward Anton
Acting Executive Director
State Water Resources Control Board
P.O. Box 100
Sacramento, California 95812-0100

Subject: Plan of Action for Delta Mendota Canal (DMC) Recirculation Study

Dear Mr. Anton:

This letter transmits to you the Plan of Action for DMC Recirculation Study ordered in D-1641 (Condition 2, pg., 153). This plan was developed jointly by the United States Bureau of Reclamation and California Department of Water Resources with assistance from the California State Department of Fish and Game, United States Fish and Wildlife Service, CALFED Bay-Delta Program, National Marine Fisheries Service, South Delta Water Agency, and other interested parties. This Plan of Action has received consensus of the CALFED Management to fulfill a commitment of the August 28, 2000 Programmatic Record of Decision for the CALFED Bay-Delta Program. This plan may be modified in the future based upon comments received from the CALFED agencies.

Reclamation is currently determining the availability of funding to carry out the study as required to meet the obligations of SWRCB D-1641. At this time, it is uncertain if sufficient funds are available within Reclamation's program. If not, Reclamation will explore alternative funding options such as CALFED funding and possible cost-share with DWR.

Reclamation would like to restate concerns about the Recirculation Study Plan. Based on the results from the earlier modeling efforts by both Reclamation and DWR, we believe that there may be serious impacts to fisheries, including straying and false attraction of migrating species, increased entrainment at the pumping plants, decreased water quality due to contaminants being flushed out of Newman Wasteway, and loss of tributary benefits to target species from reservoir releases.

If funding is secured, and the State Water Resources Control Board approves the Plan of Action and directs Reclamation to undertake the study, we anticipate that work on the study would begin as soon as practical, and will take approximately 24 months to complete after study initiation (See attached draft schedule).

Sincerely,

Lester A. Snow
Regional Director

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PLAN OF ACTION

**RECIRCULATION
FEASIBILITY STUDY**

November 6, 2000

Plan of Action

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PLAN OF ACTION

Recirculation Feasibility Study

OBJECTIVE

This study will evaluate the feasibility, benefits, and impacts of recirculating water pumped from the Delta by the Central Valley Project (CVP), and State Water Project (SWP), through the Newman Wasteway to help meet San Joaquin River flow and water quality objectives while minimizing impacts to fish and wildlife resources and existing water users in the basin. The study will identify the merits and negative impacts of recirculation as compared to the base condition and will determine if recirculation measures are compatible with other south Delta objectives and CALFED's Ecosystem Restoration Program Plan.

PLAN OF ACTION SUMMARY

Previous recirculation studies consisted of discharging water from the Delta Mendota Canal (DMC) to the San Joaquin River (SJR), via the wasteways that connect the DMC to the river, to meet the April 15 - May 15 pulse flow mandated by the Bay Delta 1994 Accord. This discharge may reduce demands on the New Melones Reservoir and other reservoirs during the spring pulse flow period and may provide more efficient basin wide use of water. New Melones would then be better able to meet water quality standards at Vernalis during the summer months.

In the proposed study, recirculation will be analyzed during the pulse flow period to help meet water quality and flow objectives at Vernalis and in south Delta channels. The proposed study will also evaluate improvements to flow and quality upstream of Vernalis. The United States Bureau of Reclamation (Reclamation) understands that the CALFED Policy Group may request the agencies to examine opportunities for recirculation outside of the pulse flow period. If this occurs, this study plan will be expanded as appropriate to incorporate the additional studies and the State Water Resources Control Board (SWRCB) will be notified. The conclusions and recommendations resulting from the study will be reviewed by a team established by the CALFED Science Program. Comments of the Science Program review team will be incorporated into the final study report.

This study will include all necessary fisheries, water quality, and water supply studies required to evaluate whether recirculation can be implemented in a manner that meets applicable laws, is consistent with CALFED's Ecosystem Restoration Program Plan, avoids jeopardizing listed aquatic resources, and is acceptable to Reclamation, the California Department of Water Resources (DWR), local, state, and federal agencies and stakeholders participating in the CALFED Bay-Delta Program, and the state and federal water contractors. If determined to be feasible, the potential implementation of a recirculation program will be covered in a later phase and will not be discussed in detail in this study. This second phase of work would include all activities necessary to move DMC water into the San Joaquin River, including the environmental documentation, consultation pursuant to the state and federal endangered species acts, permits, negotiation and execution of agreements, and a petition to the SWRCB for any necessary enabling decisions. After the initial study and prior to full implementation of a recirculation program, a monitored trial program may be recommended.

The tasks covered in this workplan are expected to take 18 to 24 months to complete. The total

estimated cost of this proposal is \$400,000.

BACKGROUND

The DMC Recirculation Appraisal study, conducted by Reclamation in late 1995, examined the probable outcome of discharging DMC water into the San Joaquin River upstream of Vernalis to meet the April 15 - May 15 pulse flow requirement. The Appraisal study determined it was physically possible to meet the pulse flows using recirculation water. However, there were many legal and institutional issues that would have to be resolved in order for recirculation to be implemented. In addition, the Appraisal study did not completely address critical water quality and fisheries issues.

Comments on the Appraisal study by several agencies were compiled for purposes of conducting a more detailed study that could lead to implementation of the recirculation proposal. One suggestion was that the study should be included as an alternative in the CVPIA PEIS. However, the changes that would be required in terms of legal and institutional matters in order to implement recirculation were incompatible with the PEIS screening criteria. The authority and funding for a separate study was not obtained.

The Department of Water Resources (J. Kipps, January 1998) used the San Joaquin River Input-Output Model (SJRIO), a mass balance water quality model for the SJR, to quantify the water quality impact of two water quality control actions in the San Joaquin River Basin:

1. Using the Delta-Mendota Canal to recirculate San Joaquin River flows when additional water is required to meet SJR spring pulse flow targets required under the May 1995 Water Quality Control Plan Delta Standards.
2. Reoperating tile drainage release and/or wetland discharge into main stem SJR from the Grassland watershed to take advantage of dilution flow provided by DMC recirculation.

The SJRIO report, *SJRIO Studies of San Joaquin River Recirculation and Reoperation of Wetland Discharge and Tile Drainage*, was based on the August 1997 draft staff report of the California Regional Water Quality Control Board, Central Valley Region, entitled, *SJRIO Wetland Discharge and Tile Drainage Reoperation Studies*, by Leslie F. Grober. The SJRIO model uses a monthly time step, which is too coarse to draw conclusive results. However, the model showed water quality improvements in the upper reaches of the San Joaquin River.

In March 1999, the CALFED Bay-Delta Program, an interagency effort of 15 state and federal agencies with management and regulatory responsibilities in the estuary proposed the initiation of a Recirculation Feasibility Study. In addition, Water Right Decision 1641, issued by the SWRCB on December 29, 1999 and revised on March 15, 2000 orders the Reclamation to, “prepare a Plan of Action (POA) for a recirculation analysis alternative to evaluate the feasibility and impacts of recirculating water from the DMC through the Newman Wasteway.” In D-1641 the SWRCB specifically requests Reclamation to address the following issues surrounding the recirculation proposal:

- a) Potential impacts of changes in water composition on Delta native fish and on imprinting of juvenile fall run chinook salmon and steelhead in the San Joaquin basin
- b) Potential effects of increased exports on in-Delta hydrodynamics and fish entrainment

- at the SWP and CVP export facilities
- c) Potential effects of salt and contaminant loading in the San Joaquin basin due to recirculation of water through the Newman Wasteway
- d) Impacts on water deliveries to exchange contractors and other contractors receiving water from the Delta Mendota Canal, the State Aqueduct, and San Luis Reservoir.
- e) The capacity of the physical facilities to implement recirculation . A description of any needed structural/channel modifications, a cost estimate, and a determination of potential conserved water over other alternatives to meet Delta flow and VAMP requirements shall be provided.
- f) Potential for improvements in water quality in the San Joaquin River as a result of recirculation.

Reclamation, CALFED, and DWR began developing this POA in October 1999. During South Delta Improvements Public Meetings held on December 9, 1999, March 16, 2000 and June 7, 2000, DWR and CALFED staff solicited public and local agency stakeholder participation in developing this Recirculation Plan of Action. Representative(s) from the general public, the South Delta Water Agency, the San Joaquin River Group Authority, and the State Water Contractors participated in Team meetings, and reviewed the draft POAs. In addition, California Department of Fish and Game began participating in the POA development. Between March and September 2000, the Recirculation Team met nine times. This document is the recommended POA from this Team.

This POA provides a framework to advance the feasibility study. The SWRCB Order stemmed from presentations by the South Delta Water Agency and others during the recent Bay-Delta hearings. The proposed study will be more detailed and refined than the previous studies, enabling a quantifiable analysis of recirculation alternatives.

TASK DESCRIPTIONS

This study consists of various tasks to determine the feasibility and desirability of recirculation in terms of the environmental, economic, and institutional framework and identify the terms and conditions for implementing recirculation. If the decision is made to proceed, a future workplan will be developed to focus on implementing recirculation.

SWRCB Decision 1641, pages 153-154, outline six issues (identified as a, b, c, d, e, and f) for evaluation in the recirculation feasibility study. The headings for each feasibility study task description identify in parenthesis the SWRCB issue(s) the particular task will address.

Task I - Alternatives Formulation (SWRCB issues # a,b,c,d,e,f)

This task consists of defining the characteristics and assumptions of the No-Action Base Condition and the various alternatives. The evaluation of alternatives will be compared to the Base Condition. The purpose of the alternatives is to explore the relative impacts and benefits of recirculation under a variety of conditions at the 2000 level of development. Items to be considered in the alternatives formulation and subsequent evaluation will include: (1) the comments received on the Appraisal study, (2) possible outcomes of the process to provide additional environmental and fisheries water under CVPIA, (3) Bay Delta Water Quality Control Plan Decision 1641, and (4) testimony from the 1998 Bay-Delta water rights hearings. All

studies are based on an objective of no net loss of water supply to the SWP and CVP.

The modeling analyses will be prioritized. The first studies will focus on the pulse flow period, where the majority of the recirculation benefits are expected to occur. Later studies focusing on periods outside the pulse flow may be undertaken if opportunities for improved water supply and water quality are identified. Three variations of recirculation are proposed to be analyzed. Table 1 outlines the various CALSIM and DSM2 alternatives being proposed for analysis in this Feasibility Study. In all, seven CALSIM and nine DSM2 studies are being proposed for this study. For the DSM2 studies, 16 years of hydrology will be studied (1976-1991). The alternatives explore using various “tools” to provide protection for both aquatic species and water quality. The tools include:

- Delta Operations Criteria
- Storage components (operations objectives)
- Recirculation conveyance, and
- South Delta Modifications

Delta Operations Criteria

The key variations of this tool provide options to include Baseline Operations Criteria, Vernalis objectives, Prescriptive Delta actions, South Delta Criteria, and San Joaquin River Recirculation. Specific detail on each tool and its variations is included in the Operation Criteria Footnotes, immediately following *Table 1. Recirculation Scenario/Evaluation Alternatives*.

Storage Components (Operation Objectives)

In the base condition only, Don Pedro and Exchequer are modeled to operate and provide additional flows at Vernalis per the San Joaquin River Agreement. New Melones Reservoir is operated to meet salinity flow objectives in both the base condition and project studies. San Luis reservoir will be used to prime the system for recirculation. Specific detail on each tool and its variations is included in the Operation Criteria Footnotes, immediately following *Table 1. Recirculation Scenario/Evaluation Alternatives*.

Recirculation Conveyance

Conveyance tools include the use of the full Joint Point of Diversion and recirculation to the San Joaquin River via the Newman Wasteway.

South Delta Modifications

During the pulse flow period, the Head of Old River (HOR) fish barrier is in operation. The 1999 Temporary Barrier operations show that at least 1000cfs must be let through the HOR barrier to provide this mitigation in the absence of three tidal barriers to mitigate for the interior south Delta stage impacts caused by the operation of the HOR barrier. For most years, the Vernalis Adaptive Management Program (VAMP) flows are significantly less than 5700 cfs. To protect south Delta water levels and allow the VAMP to proceed as planned, the Middle River, Old River at Tracy and Grant Line Canal flow control structures need to operate. This much flow cannot be let through the HOR when the VAMP flows are significantly less than 5700 cfs.

Therefore, the POA will analyze the four barrier alternative case with an explanation that: 1) the study assumes that the VAMP experiment and the HOR barrier operate during the pulse flow in all years; and, 2) to protect interior south Delta stages, three tidal barriers need to operate to mitigate the impacts of the HOR barrier during the VAMP experiment.

Modeling Assumptions

One assumption common to all alternatives is that there will be no new construction of storage or conveyance facilities as a result of recirculation except for the fish and flow structures in the south Delta. However, repairs necessary to allow recirculation, including but not limited to, existing structures, and removal of sediment, vegetation, and debris blocking the wasteway will be assumed. Another assumption is that water right protections will be imposed along the San Joaquin River in both the base and recirculation alternatives so that the DMC recirculated water and/or San Joaquin River Agreement purchased water is allowed to flow to the Delta, rather than becoming an additional source of water for the San Joaquin River diverters.

Task 2 - Alternatives Modeling including Water Quality and Power Generation Analysis (SWRCB issues #a,b,c,d,e,f)

CALSIM is to be used in conjunction with DSM2 to conduct the mathematical model runs to assess the impact of different alternatives for this study on the base condition and one alternative from each plan (Table 1). DSM2 is being extended to include the study area along the San Joaquin River. A full sequence of model runs for each alternative will include a CALSIM run, DSM2 run, statistical water quality analysis, and a power generation analysis. It is likely that some alternatives will not require the full sequence of model runs.

CALSIM will be used for the surface water analysis and provide input into DSM2. The available pumping and conveyance capacity from Banks to the O'Neill Forebay will be determined, and the capability for delivery of mitigation water to CVP contractors south of the Delta will be computed separately for the April 15-30 and May 1-15 time periods.

DSM2 will provide water quality predictions at the Delta pumping plants (Tracy and Banks), at various locations within the Delta, and along SJR upstream from Vernalis, and at Vernalis. The study of other conservative constituents of interest, like Boron, may also be included in this analysis. All model runs will attempt to meet applicable laws and standards in terms of flow quantity and water quality, unless otherwise noted.

Task 3 - Fish & Wildlife Evaluation on Fisheries, Wetlands, and Contaminants (SWRCB issues #a,b,c,f)

The U.S. Fish and Wildlife Service (FWS), the National Marine Fishery Service (NMFS), and the California Department of Fish and Game (DFG) will evaluate both the beneficial and adverse impacts of recirculation (compared to the base condition) on delta smelt, splittail, salmonids, steelhead, and other aquatic resources from the Newman Wasteway through the southern and central Delta. The Bureau of Reclamation is committed to working together with the fisheries agencies to develop methodologies to evaluate the many concerns regarding the potential impacts of recirculation on the aquatic species (both resident and anadromous) in the

San Joaquin River and Delta.

The fisheries agencies will evaluate the impact of the Delta Barriers when operated in the manner assumed in the recirculation study. There is a concern that the barrier operations proposed might cause adverse impact to delta smelt and Sacramento splittail by blocking free movement, entrapping fish in between the two barriers, and making them more susceptible to entrainment through agricultural diversions.

The use of water from San Luis Reservoir to “prime” the recirculation is a concern to the fisheries agencies as it will likely occur at a time when the CALFED Management Agencies will likely be expending EWA assets from San Luis in order to decrease exports at the SWP Banks Pumping Plant. Impacts on the ability of the projects to provide EWA assets will be evaluated. In addition, impacts from returning water to San Luis Reservoir prior to the end of the pulse flow period will have to be evaluated. The fisheries agencies feel that a relaxation of the E/I ratio during the pulse flow period is not feasible, and if JPOD were used, one-half of the pumped water would be provided to EWA. This would result in a longer period of increased pumping during the pulse flow period, with subsequent potential impacts to aquatic species. The fisheries agencies will evaluate the impact of these proposed actions on the targeted species.

Potential mobilization of contaminants from Newman Wasteway, as well as the potential change in water quality in the San Joaquin River from the Newman Wasteway down through the Delta, is another major concern for aquatic species. Results from Task 4 – Water and Sediment Sampling and Laboratory Analysis will be reviewed with special emphasis on potential for toxicity to aquatic species. The agencies will also evaluate the impact of water quality changes (e.g. total dissolved solids) on resident species in the San Joaquin River and the Delta.

Another major concern for the fisheries agencies is the question of imprinting of smolts. Although a methodology to evaluate this does not currently exist, at a minimum the agencies will conduct a literature search to determine if imprinting studies done in other areas may be able to provide guidance on impacts in the San Joaquin River Delta.

The fish and wildlife agencies will also evaluate if recirculation is consistent, or can be made consistent, with CALFED's Ecosystem Restoration Program Plan. This task will begin early in the study, and will use modeling output for flows, velocities, stages, and water quality. This task will be ongoing throughout the study and a final analysis will be produced after completion of all tasks.

MILESTONE REVIEW

CALFED and Reclamation will review the modeling output to determine if recirculation can help meet San Joaquin River flow and water quality objectives at Vernalis, provide improvements in flow and water quality at points upstream of Vernalis, and substitute for releases of high quality water from San Joaquin River tributaries. Impacts to fisheries will also be evaluated and if the negative impacts cannot be offset by recirculation benefits or cannot be mitigated, as compared to the base condition, the study will end.

If the study results from Tasks 1 and 2 show potential for meeting the study objectives and recirculation is compatible with other south Delta objectives, the study will continue. If the study results and conclusions from Task 3 show potential for meeting the study objectives while

avoiding net adverse impacts to fish and wildlife resources in the basin or significant unresolvable conflicts with CALFED's Ecosystem Restoration Program Plan, the study will continue. If recirculation does not appear to improve San Joaquin River flow and water quality objectives and does not save water, or has unmitigable adverse impacts as compared to the base condition, the study will end and staff will document the study findings (Task 8).

Task 4 - Water and Sediment Sampling and Laboratory Analysis (SWRCB issues #c,f)

The Central Valley Regional Water Quality Control Board has requested that a sampling and characterization program for sediments in the Newman Wasteway be included in the study. Although historically there have been limited low flow releases into the Newman Wasteway, the Regional Board has requested this analysis because of the magnitude of releases expected under recirculation.

Regional Board is concerned about the possibility of additional scour within the Newman Wasteway and subsequent remobilization of the scoured sediment during recirculation. Consequently, the Regional Board has requested that the sediments be characterized for trace elements and organochlorine pesticides. The scope of this testing is shown in Table 2.

Table 2. Trace Elements and Organochlorine Pesticides to be Analyzed

<u>CONSTITUENTS</u>	<u>EPA Test Method Number (test both solid and dissolved constituents)</u>
<u>TRACE ELEMENTS:</u>	
Arsenic	200.8
Cadmium	200.8
Chromium	200.8
Copper	200.8
Lead	200.8
Mercury	200.8
Nickel	200.8
Selenium	200.8
Silver	200.8
Zinc	200.8
<u>ORGANOCHLORINE PESTICIDES:</u>	
Aldrin	8080
Alpha BHC	8080
Beta BHC	8080
Gamma BHC (Lindane)	8080
Chlordane	8080
4-4 DDD	8080
4-4 DDE	8080
4-4 DDT	8080

Diazinon	8080
Dieldrin	8080
Endosulfan	8080
Endrin	8080
Heptachlor	8080
Heptachlor epoxide	8080
Hexachlorocyclopentadienne	8080
Methoxychlor	8080
Toxaphene	8080
Chlorpyrifos	8140

A field examination will be made of the Newman Wasteway to characterize the sediments that may scour within the Newman Wasteway and subsequently be remobilized in the San Joaquin River during recirculation. The field data will also be used to estimate the location and quantity of sediment, vegetation, and debris that may need to be removed to restore channel capacity sufficient for the proposed recirculation flows. This material will be analyzed so that it can be disposed of properly if it is removed.

The Regional Board has also indicated that additional sediment and water sampling, and a waste discharge report prior to any release, and sampling of water during the release, may be required.

An alternative to the aforementioned testing program could be a brief monitored release of DMC water through the wasteway. This could be a less expensive and more definitive way to determine whether toxics are both present and subject to mobilization in concentrations greater than the concentrations of the same toxins in the receiving river waters.

Task 5 - Review of Water Rights, Agreements, Permits, and Other Legal Issues (SWRCB issues #b,d,e)

A review will be done to identify the legal constraints/considerations associated with recirculation. A plan will be developed to address these legal issues if recirculation is found to be feasible; some of the issues will require action by the State Water Resources Control Board.

Water rights issues include:

1. CVP San Luis Reservoir water will prime the system.
2. Recirculated water shall be returned to the CVP and is not subject to sharing under the COA.
3. Relief from the restrictions on Delta pumping (i.e., percent of inflow/outflow,) if necessary; and,
4. Limitations imposed on diverters along the San Joaquin River so that the DMC recirculated water is allowed to return to the Delta, rather than becoming an additional source of water for these diverters.

The analysis will recommend actions to assure the recirculated water will not be diverted prior to reaching the Delta.

Task 6 - Economic Analysis (SWRCB issues#a,b,c,d,e,f)

This task will be performed for the base condition plus one alternative from each of the three plans (Table 1). The purpose of this task is to determine the costs and savings of DMC recirculation. Costs will be evaluated both in terms of implementation costs and water costs compared to the base condition. Possible implementation costs include removal, transport, and disposal of wasteway sediment, vegetation, and debris that is blocking the wasteways; repair or modification of wasteway structures; addition of wasteway water quality monitoring to the existing monitoring program; pumping energy costs for water acquired at Banks; and, other costs associated with agreements, permits, and approvals. Additional costs and savings may also be associated with changes in power operations, and savings in water purchases.

Savings will be evaluated based on the financial and water costs of recirculation as compared to the base condition, which includes the San Joaquin River Agreement. Comparisons will include the relative ability to provide VAMP flows in all years, additional flexibility to project operations, and improvements to both water supply and water quality to the San Joaquin River system.

Task 7 - Public Involvement (SWRCB issues #a,b,c,d,e,f)

This task will involve the general public and all key interested parties in the study process, to ensure the success of the study. The guiding principles will be team coordination, information materials, public notices, and public meetings. CALFED's South Delta Improvements Team will prepare appropriate public notices and coordinate public meetings.

Task 8 - Preparation of Study Report and Workplan for Implementation (SWRCB issues #a,b,c,d,e,f)

The purpose of this task is to prepare a feasibility report summarizing the study findings that will provide CALFED policymakers and the SWRCB members with adequate information to make a decision on whether or not recirculation is acceptable and desirable in terms of the basin water supply, and the current environmental, economic, and institutional framework. If the recommendation is to proceed with recirculation, the report will *also* provide a preliminary identification of the terms and conditions for its implementation. A team established by the CALFED Science Program will review the draft study report or implementation workplan. The team's comments and recommendations will be included in the final report and workplan. The costs of the science team review will be funded by the CALFED Science Program.

DRAFT FOR MANAGEMENT REVIEW